Low fat soy yoghurt drink with kiwi flavour

Stage IV: Product Commercialization

Group B

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Introduction

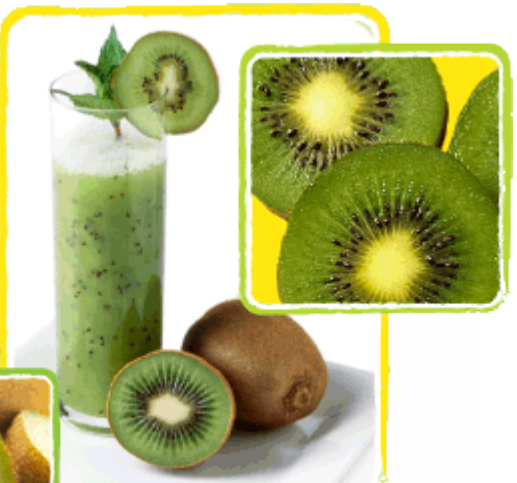
Stage IV:

- Confirm product specifications
- Confirm using correct process conditions
- Aim ----> good quality commercial product

Outline

- Unfinished tasks from Unit III & Commercial test
- Shelf-Life and Packaging
- GHP & GMP Guideline
- HACCP Analysis
- Labelling Legislation and Quality Control

Unfinished tasks from Unit III & Commercial test



Unfinished tasks from Unit III

Unit III

Optimization experiments

54 Assessors

→ Not ideal results, choose 18 odd answer, repeat optimization experiment for those 18 assessors and collect suggestions.

↓

Unit IV

Optimization experiments & survey

18 Assessors

↓

Results analysed in R for 18 assessors, not completely understand of 9 point scale. So remove 18assessors' results from 54s'.

←

Unit IV

R analysis

36 Assessors

Results analysis for 36 assessors

Figure 1. Response surface plot for overall acceptability

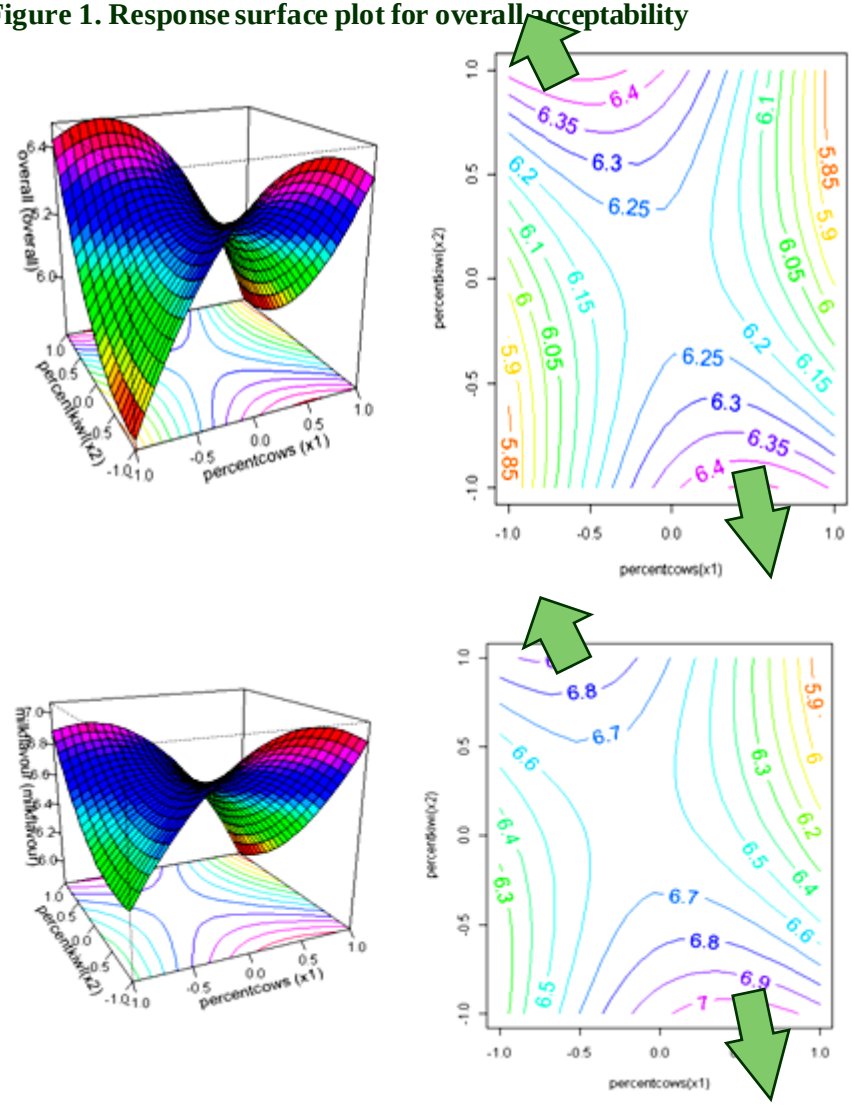


Figure 3. Response surface plot for kiwi flavour

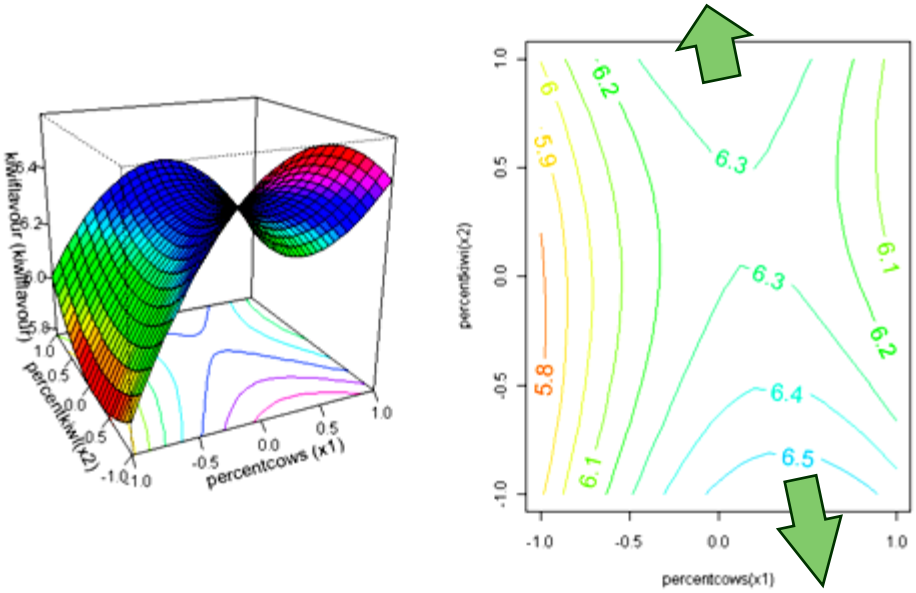


Figure 2. Response surface plot for milk flavour

2 best combination from optimization test

Ingredient	Cow's yoghurt(%)	Soya yoghurt(%)	Kiwi juice (%)	Sugar (%)	Water (%)
A1	11	46.5	12	10.5	20
A2	18	43.5	8	10.5	20

Commercial test

- Use 2 best combinations and 2 market products for commercial sensory test.

Products	Low fat soya yogurt drink with kiwi flavor 1	Low fat soya yogurt drink with kiwi flavor 2	low fat drinking yoghurt with L.casei Danone culture, Vitamin B6+D and orange	low fat drinking yoghurt with L.casei Danone culture, Vitamin B6+D and multifruit
sample code	949	763	884	262
Test code	A	B	C	D

*TEST for: sweetness, milk flavour, fruit flavour, thickness and overall acceptability

Commercial test results analysis

Attribute		diff	lwr	upr	P adj
sweetness	B-A	-0.08928571	-1.0722410	0.89366962	0.9917193
	C-A	-1.78571429	-2.7686696	-0.80275896	0.0000003
	D-A	-1.12500000	-2.1079553	-0.14204467	0.0022097
	C-B	-1.69642857	-2.6793839	-0.71347324	0.0000010
	D-B	-1.03571429	-2.0186696	-0.05275896	0.0058285
	D-C	0.66071429	-0.3222410	1.64366962	0.1494558
milk flavour	B-A	0.05357143	-0.8182248	0.9253677	0.9973923
	C-A	-2.14285714	-3.0146534	-1.2710609	0.0000000
	D-A	-1.64285714	-2.5146534	-0.7710609	0.0000001
	C-B	-2.19642857	-3.0682248	-1.3246323	0.0000000
	D-B	-1.69642857	-2.5682248	-0.8246323	0.0000000
	D-C	0.50000000	-0.3717962	1.3717962	0.2708005
thickness	B-A	-0.21428571	-1.235395	0.8068239	0.9106447
	C-A	-2.62500000	-3.646110	-1.6038904	0.0000000
	D-A	-2.60714286	-3.628252	-1.5860333	0.0000000
	C-B	-2.41071429	-3.431824	-1.3896047	0.0000000
	D-B	-2.39285714	-3.413967	-1.3717476	0.0000000
	D-C	0.01785714	-1.003252	1.0389667	0.9999391
overall acceptability	B-A	-0.03571429	-1.0162939	0.9448653	0.9994519
	C-A	-2.44642857	-3.4270081	-1.4658490	0.0000000
	D-A	-1.78571429	-2.7662939	-0.8051347	0.0000002
	C-B	-2.41071429	-3.3912939	-1.4301347	0.0000000
	D-B	-1.75000000	-2.7305796	-0.7694204	0.0000004
	D-C	0.66071429	-0.3198653	1.6412939	0.1478626

Commercial test results analysis

Attribute		Ranktotals
fruit flavour	A-B	4.0000
	A-C	140.0000
	A-D	92.0000
	B-C	136.0000
	B-D	88.0000
	C-D	48.0000
critical distance for HSDRanks		35.1588

SUM Value:

A>B>D>C

For sweetness, thickness and overall acceptability:

A>B>D>C

For milk flavor:

B>A>D>C

For fruit flavour:

A>B>D>C

As a result, sample A is the best one among 4 products. So the A combination will be chose for the final product and shelf-life test.

Stage IV: Product Commercialization

- Unfinished tasks from Unit III & Commercial test
- **Shelf-Life and Packaging**
- GHP & GMP Guideline
- HACCP Analysis
- Labelling Legislation and Quality Control

Shelf-life & Packaging

Aim: *Determination of:*

- intrinsic and extrinsic factors
- propose methods for control and monitor shelf-life
- propose adequate packaging

Definition of Shelf-Life

Shelf-Life =

"the period during which a food product maintains its microbiological safety and suitability at a specified storage temperature and, where appropriate, specified storage and handling conditions" (Codex Alimentarius)

Key of prediction: identification of types of deteriorative reactions that impact food quality

Factors affecting Shelf-Life

- **Intrinsic factors**
  - Water activity (*a*w)
  - pH
  - Oxidation-reduction potential
  - O_2 content
  - Enzymes
  - Concentration of the reactive compounds
  - Microbial content

- **Extrinsic factors**
  - Temperature
  - Relative Humidity (RH)
  - Light
  - Total and partial pressures of different gases
  - Mechanical stresses

- **Packaging properties**

Intrinsic factors

Aw , pH, oxidation – reduction potential

Affect microorganisms' growth ability

- Predicting the growth of bacteria, yeasts and moulds (a_w)
- Yeasts compared to bacteria, can grow in a more acid environment (pH)
- Micros enzyme expression & thermal resistance (ORP)

Intrinsic factors

Microbial content

- Desirable & undesirable changes to the quality of yogurt drink

- Yeasts and moulds: the major causes of microbial *spoilage* of yogurt drink

Extrinsic factors

Temperature

- Material of packaging can affect T of yogurt drink

- Sterilisation (40°C): small amount of heat-resistant spores survive ⇨ *chemical* or *organoleptic changes* (taste, odour, colour, feel) will be avoided

- Optimum T for lipase & protease activity=lower than the optimum for bacterial growth ⇨ *off-flavours* can develop even if the bacterial counts low

Extrinsic factors

Relative humidity

- Impact on the water activity
- Package: has to block water vapour

Presence of gases

- Atm inside the package affect the microorganisms' growth → *vacuum packaging*

Light

- Discoloration and flavour defects (intensity, length)

Quality assessment

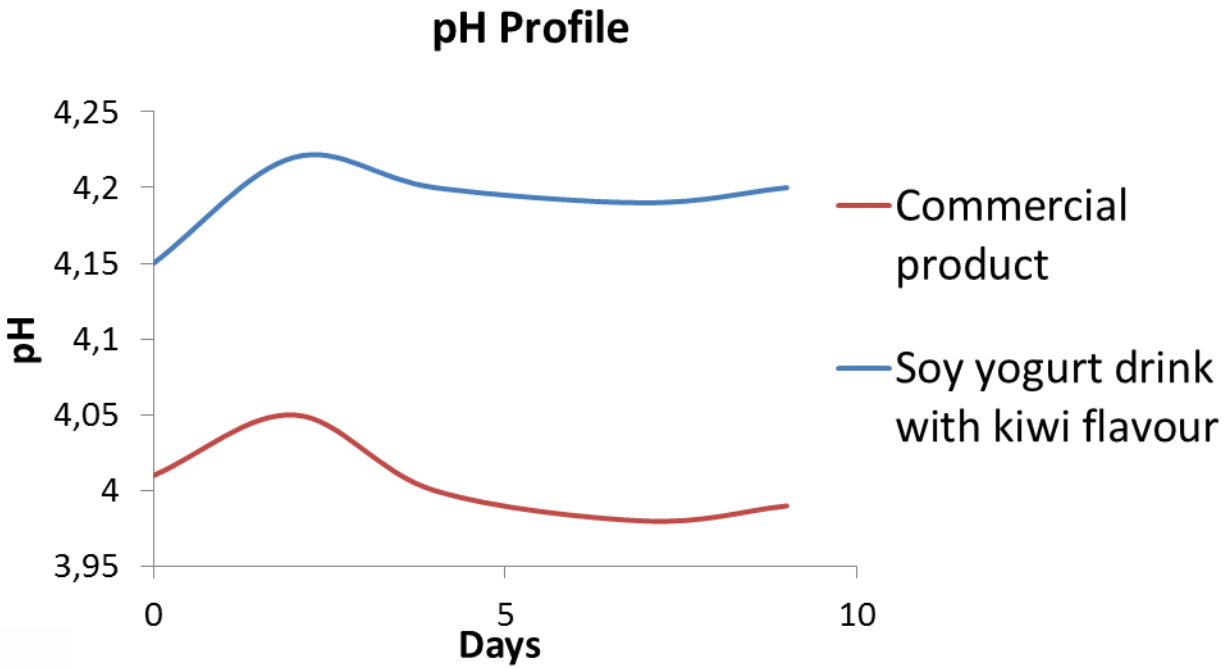
- Visual assessment (e.g colour, phase separation)
- Sensory profiling
- Analytical measurements (e.g viscosity)
- Shelf-life of drinking yogurt: 2-3 weeks at 4°C

Shelf-Life Experiment

- **Objective:** shelf-life comparison between our product and commercial product ('Actimel'orange drinking yogurt) & determine shelf-life

  - *Store at **4°C***
  - ***pH***
  - *sensory testing (**odour**)*
  - ***4 weeks** (if spoilage, exp. will stop)*
  - *Measurements & sensory evaluation **every 2 days***
  - ***12** sterilised glass **bottles** covered with aluminium foil*
  - ***14** trained **assessors***

Shelf-Life Experiment



*Results till day 9

Packaging

- Protects form, shape and texture of the food inside
- Packaging material → barrier from water vapour, oxygen
- Ensuring safety of product & consumer
- Carries important information on the label
- Significant role in shelf-life of yogurt drink (maintain its quality)
- Primary, secondary and tertiary packaging

Primary packaging

1^0=Direct contact with the contents

O_2, H_20 vapour barrier

Prevents entry of flavour, odour from environment

PET bottles (250mL)

T resistant

Prevents oxidation

Avoid light effect

Secondary packaging

2^0 = outer carton or multipack

Paperboard laminated cartons

- Shrink sleeves for labelling and decoration
- Protect from light
- Carry the label
- 4 bottles/carton

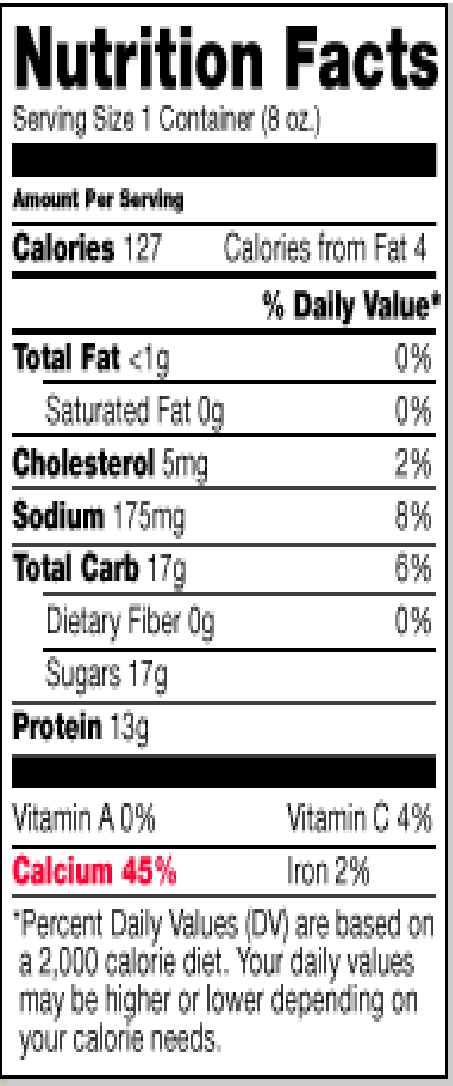
Tertiary packaging

3^0 bulk handling and shipping

Pallets or crates

- Minimum damage to the product and easy carrying

Labelling



Nutrition Facts

Serving Size 1 Container (8 oz.)

Amount Per Serving

Calories 127	Calories from Fat 4
	% Daily Value*
Total Fat <1g	0%
Saturated Fat 0g	0%
Cholesterol 5mg	2%
Sodium 175mg	8%
Total Carb 17g	6%
Dietary Fiber 0g	0%
Sugars 17g	
Protein 13g	
Vitamin A 0%	Vitamin C 4%
Calcium 45%	Iron 2%

*Percent Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

- Name of manufacturer
- Manufacturing and used by date
- Ingredients (+stabiliser, acidity regulator)
- Allergens (soy, kiwi)
- Flavour
- Net quantity (ml)
- Name of distributor
- Definition of yogurt drink
- Conditions of storage
- Barcode

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- **GHP & GMP Guideline**
- HACCP Analysis
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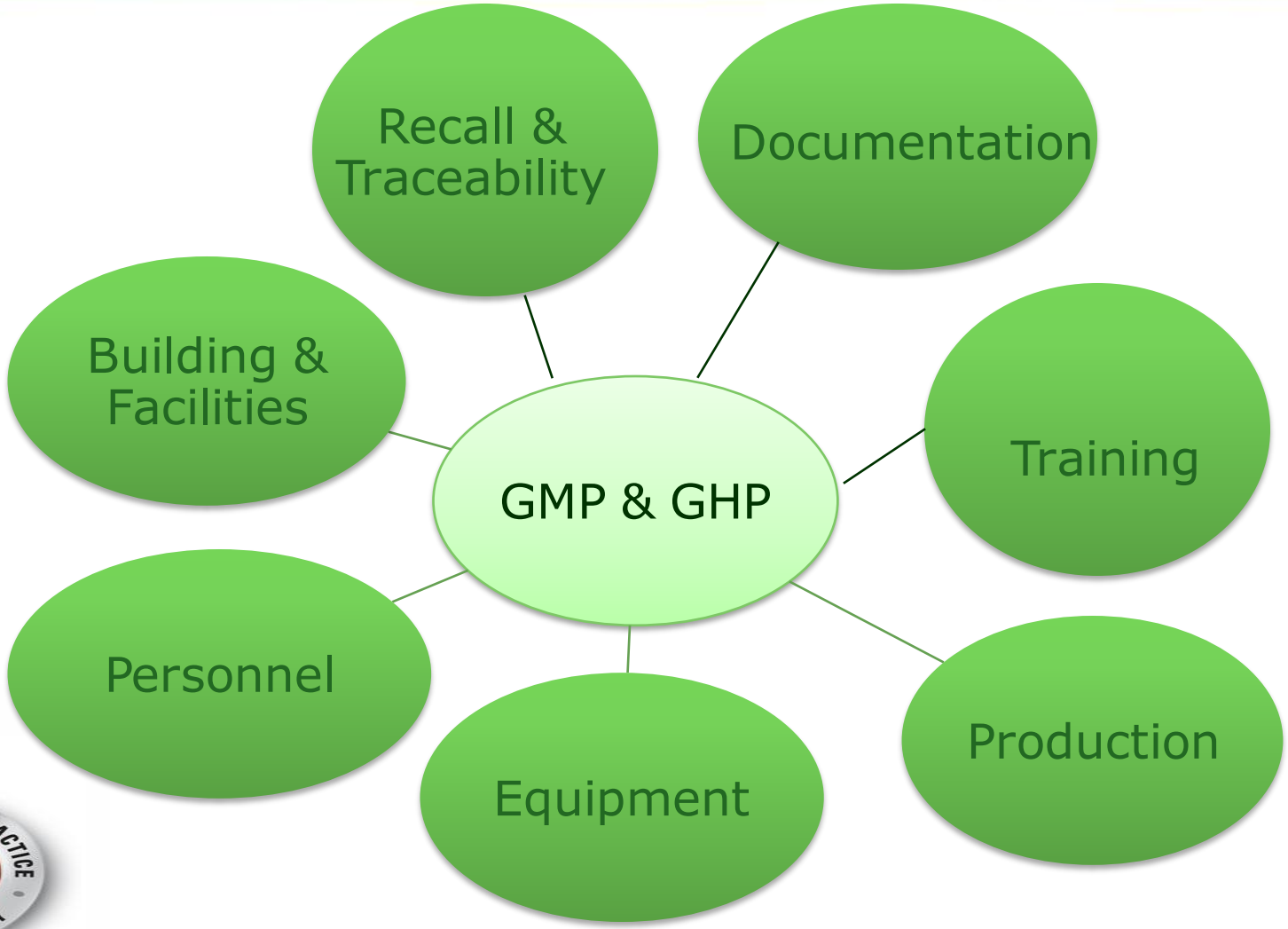
GMP/GHP

Definitions

- **GMP** – "Part of Quality Assurance which ensures that products are consistently produced and controlled to the quality standards appropriate to their intended use.''
- **GHP** – "All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain"

GMP/GHP


Recall & Traceability
Documentation
Building & Facilities
GMP & GHP
Training
Personnel
Equipment
Production

GMP/GHP

Building & Facilities

GMP/GHP

GMP

- Location
- Layout
- Internal design
- Facilities
- Storage

GHP

- Cleaning
- Personal hygiene

GMP/GHP

Personnel

- Sickness reporting
- Watches, jewellery or any belongings
- Prohibition of smoking, eating and alcohol
- Keep body, hair, face, hands and fingernails clean

GMP/GHP

- Protective clothing
- Wear gloves and hand covering
- Washing hands with sanitizers after visiting the toilet
- Follow signs & instructions
- Health check up at least once in 6 months
- Rules for visitors

GMP/GHP

--Production

GMP

- Incoming material requirement
- Time and temperature control
- Control of specific process step
- Specifications
- Microbiological, chemical and physical contamination
- Packaging, Storage and distribution
- Checking the parameters of raw material & finished product
- Use of controlled atmosphere

GHP

- Hygiene & sanitation of equipments & tankers
- Checking of all the equipments & tanks after cleaning
- Storage premises should be clean
- Maintenance of equipments
- Use of CIP system
- Hygiene of product distribution vehicles

GMP/GHP

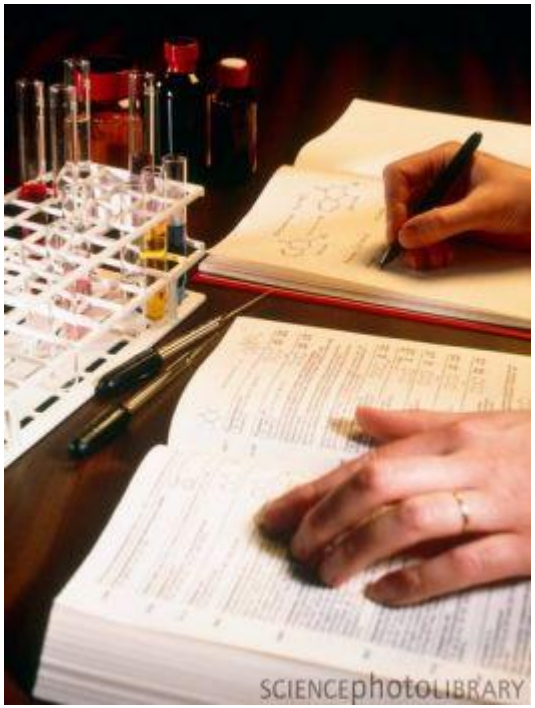
Training

- Managers and supervisors should have enough knowledge of GMP,GHP and HACCP
- Efficient skills and knowledge
- Training by expertise

GMP/GHP

Documentation

- Records of purchasing
- Analysis
- Employee
- Marketing
- Processing operation
- Process testing



GMP/GHP

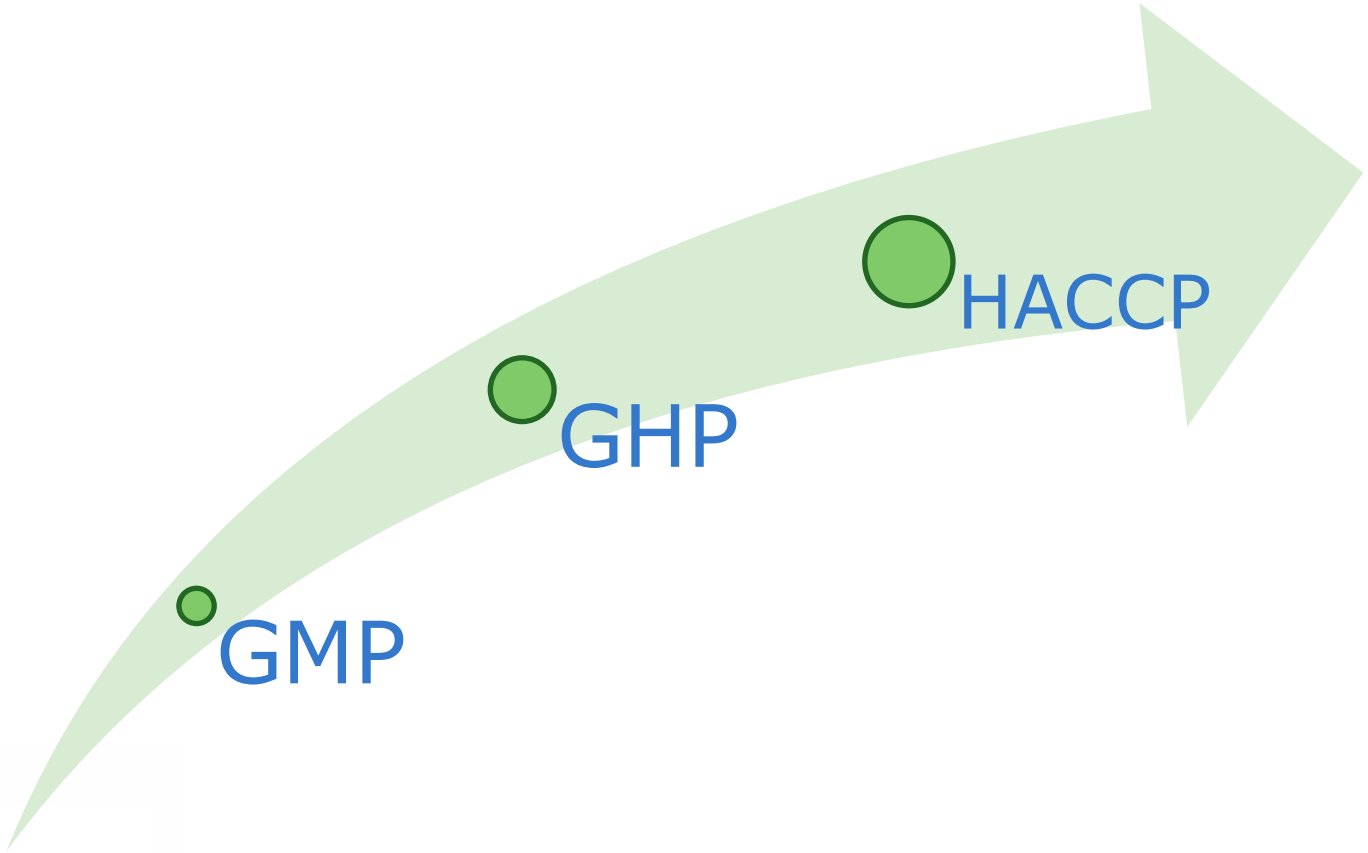
Recall and traceability

- Changes in physical, chemical and microbiological changes in the product during storage at retailers shelf

- Keep under observation

- Maintain effective mechanism for identification and traceability

GMP/GHP



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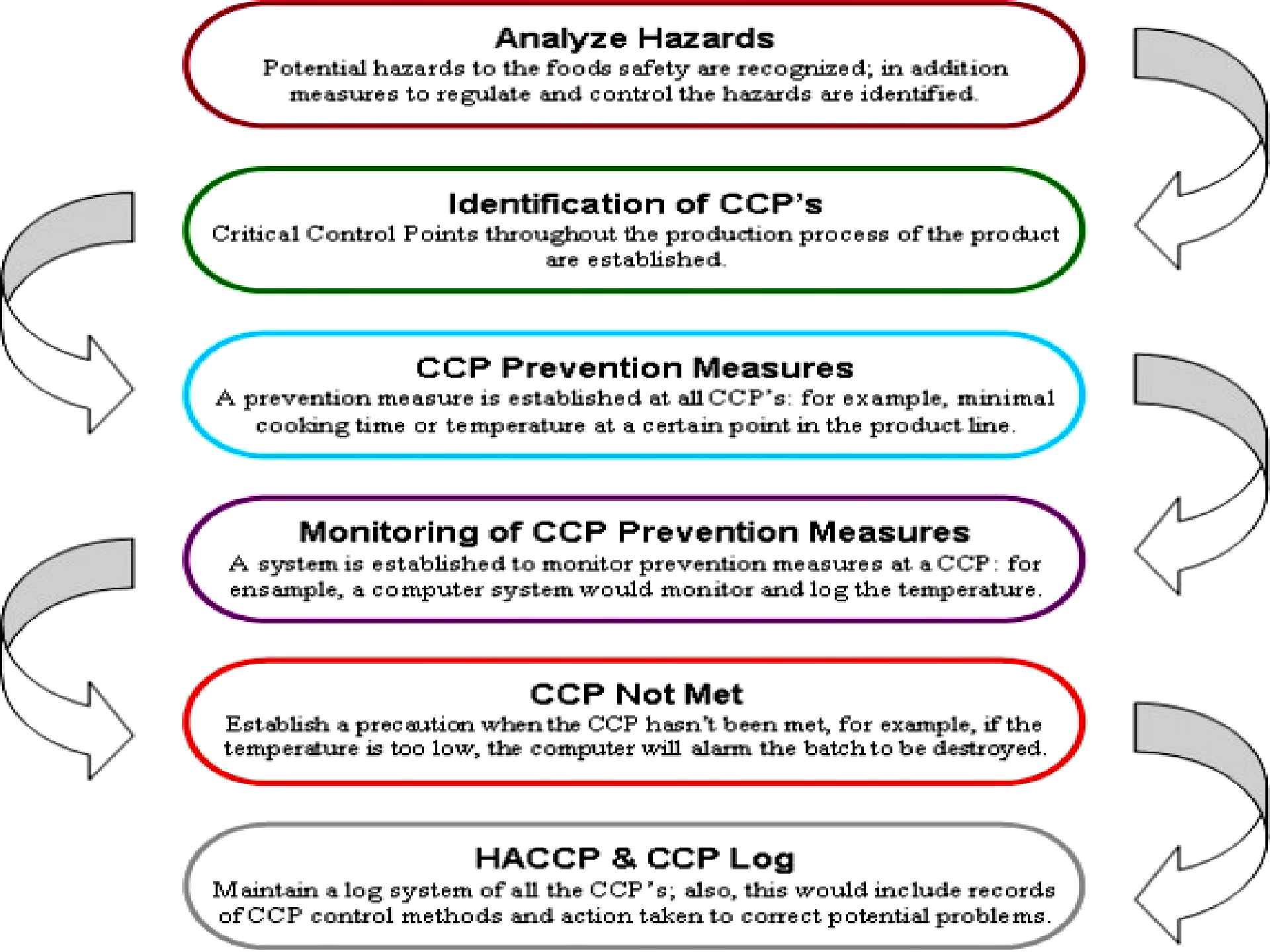
HACCP analysis of production

Hazard **A**nalysis
and **C**ritical **C**ontrol **P**oint

A management tool used to protect the food supply against biological, chemical and physical hazards


Analyze Hazards
Potential hazards to the foods safety are recognized; in addition measures to regulate and control the hazards are identified.
Identification of CCP's
Critical Control Points throughout the production process of the product are established.
CCP Prevention Measures
A prevention measure is established at all CCP's: for example, minimal cooking time or temperature at a certain point in the product line.
Monitoring of CCP Prevention Measures
A system is established to monitor prevention measures at a CCP: for ensample, a computer system would monitor and log the temperature.
CCP Not Met
Establish a precaution when the CCP hasn't been met, for example, if the temperature is too low, the computer will alarm the batch to be destroyed.
HACCP & CCP Log
Maintain a log system of all the CCP's; also, this would include records of CCP control methods and action taken to correct potential problems.

Description of production

Formulation: cows milk: 27.5ml soy milk: 116.25ml kiwi: 30g sugar: 26.25g water: 50ml

Allergen declaration: Contains: Milk, soy, and kiwi

- Low fat soy yogurt drink with kiwi flavour will be packed in PET bottles of 250 ml and will be sold in a refrigerated product case to dairy store

- Finished product is to be kept refrigerated at 4 ℃ during storage, transportation and display in retail store. The product has a best-used-by refrigerated shelf-life of 2 weeks from the date of manufacturing

- The product is intended for consumption by the general population except milk, soy and kiwi allergy people

Identify all potential hazards

- Biological hazards
  - Pathogens: E.coli, Cryptosporidium parvum, staphylococcus aureus, and Salmonella
- Chemical hazards
  - Toxins e.g. Patulin
  - Agricultural chemicals e.g. Pesticides
  - Toxic compounds e.g. cleaning compounds
- Physical hazards
  - Skin residuals
  - Metal fragments

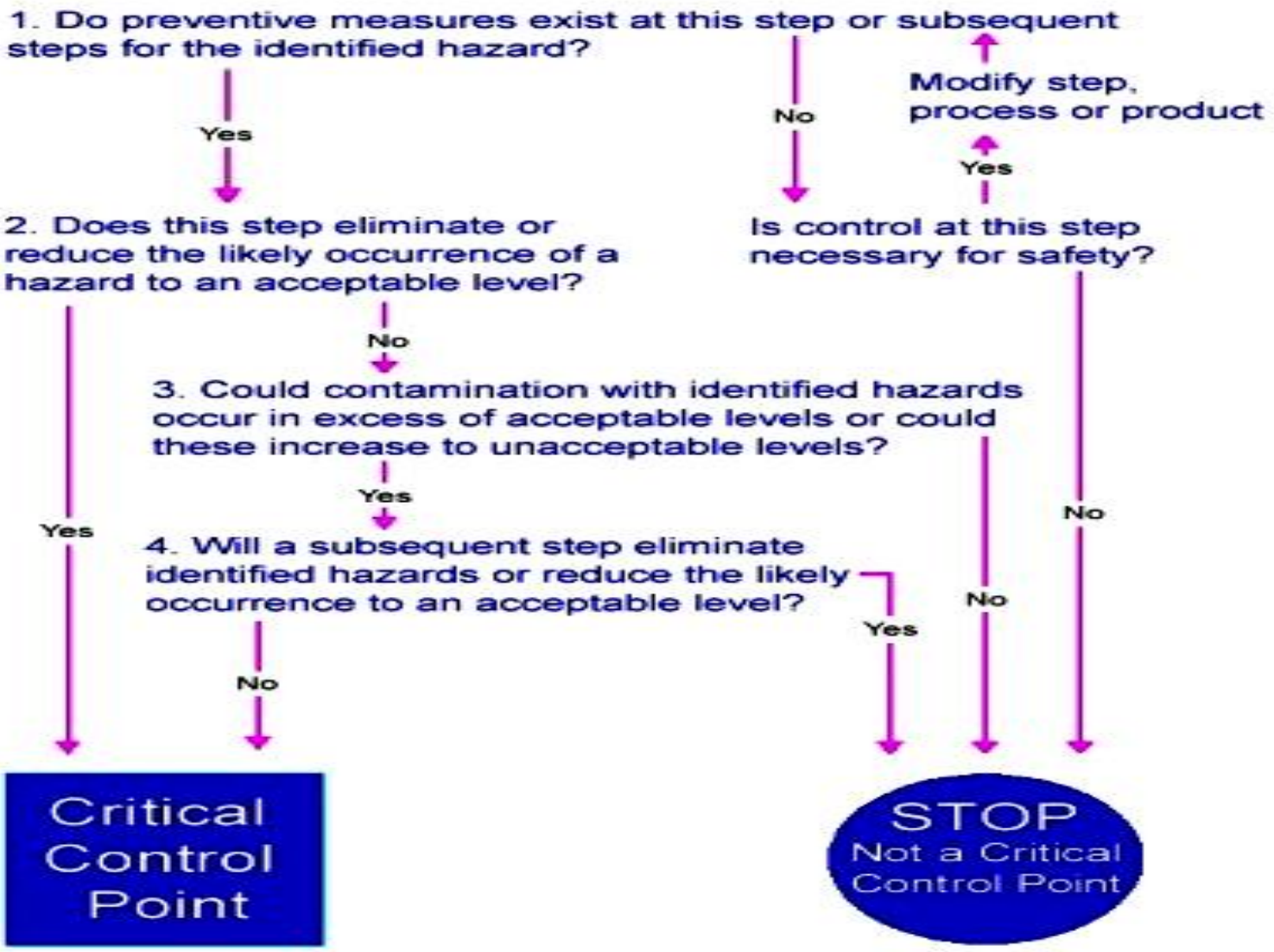
Evaluate all potential hazards

Hazards may present in

- raw materials
- processing
- packaging
- storage
- distribution

(Flow Diagram for soy yoghurt drink with kiwi flavour)

CCP decision tree



Critical Control Points

Yoghurt line

Receiving of cow's milk and storage (CCP1)
Checking of microbial and chemical parameters (cow's) quality parameters (soy, stored at 4°C)

Pasteurisation (CCP2)
Temp=62.8°C, Time=30min.

Fermentation (CCP3)
Temp=40°C-45°C, Time= 4-5 hr.

kiwi juice line

Kiwi Receiving & Stage (CCP1)
Check quality parameters & storage time/temp.

Sorting (CCP2)
Size, appearance, <1% visual damage.

Washing (CCP3)
$KMNO_4$(0.1%)to reduce microbial load.

Peeling and Slicing (CCP4)
Remove outer skin & middle hard core part,
Cut into small pieces under 10℃.

Pasteurisation (CCP5)
Temp=72°C, Time=30second.

Cooling & Filtration (CCP6)
Size and quality of particles remaining.

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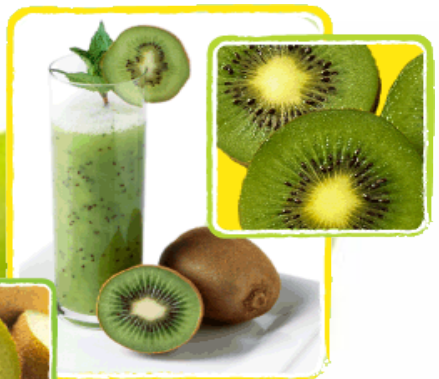
- **Labelling Legislation and Quality Control**

Regulations

- General Regulations
- Relevance Regulations

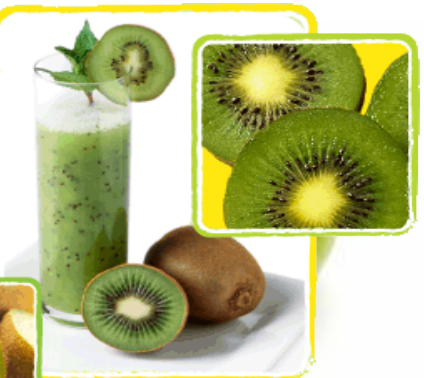


General regulations

Food Labelling Regulation 1996

- ✓ Name
- ✓ Ingredients
- ✓ Durability
- ✓ Special storage conditions
- ✓ Manufactor's name and address

- ✓ Place of Origin
- ✓ Additional Requirements
- ✓ Instructions



Name

- Low fat soy yogurt drink with kiwi flavour

  NO legal name

  'skimmed milk' and various species of fish

  NO customary name

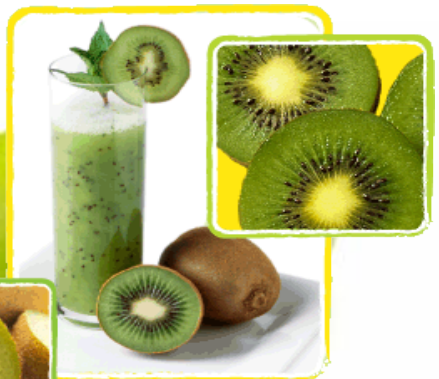
- Low fat soy yogurt drink with kiwi flavour

  is a **descriptive name**

Ingredients

Descending order of weight

Soy yogurt(Water, Hulled Soya Beans (7.9%), Sugar, Tri-Calciumcitrate , Stabiliser (Pectin), Acidity Regulators (Citric Acid, Sodium Citrate), Sea Salt , Flavouring, Vitamins (B12, D2), Emulsifier (Lecithin), Yogurt Cultures (S. Thermophilus, L. Bulgaricus), Antioxidants (Ascorbyl Palmitate, Tocopherol-Rich Extract), Water, Kiwi, Cow's Milk, Sugar, Additives

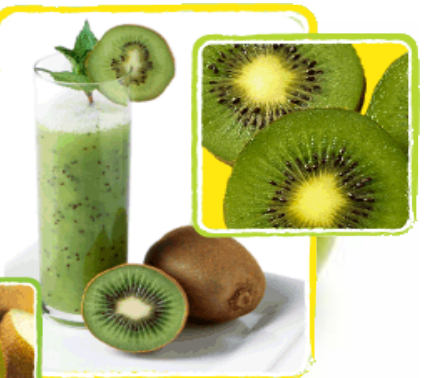


Nutrition Labelling

Energy Value, Amounts of Protein, Carbohydrate, Sugars, Fats, Saturates, Fibre and Sodium/100(g or ml).

Nutritional Values

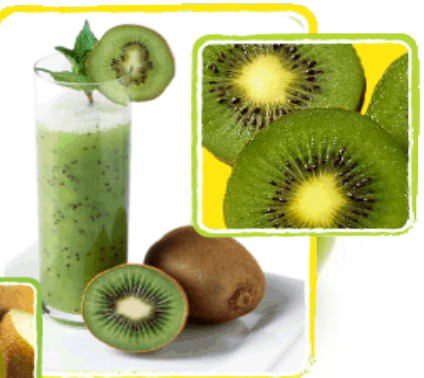
Typical values	Per 100g
Energy kJ/kcal	191 / 46
Protein	4 g
Carbohydrates	2.1 g
of which	
- Sugars	2.1 g
- Lactose	nil
Fat	2.3 g
of which	
- Saturates	0.4 g
- Cholesterol	nil
Fibre	1.0 g
Sodium	0.04 g
(equivalent as salt)	0.10 g
Calcium	120 mg (*)
Vitamins	



Durability

Use by day/month/year

- Use by 5/8/2011
- Use by **5/Aug/2011**



Special storage conditions

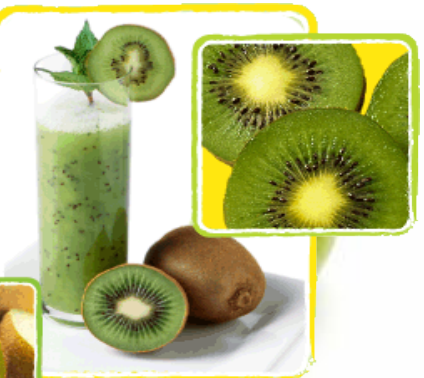
- Keep refrigerated at 5 degree
- Use within 5 days of opening and before ‘use by' date.
- Do not freeze.

Allergen Information

14 ingredients are required to be labelled

Allergy Information:

- **Contains Milk**
- **Soya beans**



Relevance Regulations

- Food Safety Act 1990
- Trade Descriptions Act 1968
- Weights and Measures Act 1985
- Weights and Measures (Packaged Goods) Regulations 2006

  an indication of quantity
- Food (Lot Marking) Regulations 1996

  a lot mark

Quality Control

- ***Management of Raw Materials***
- ***Management of Processing***
- ***Management of Finished Products***

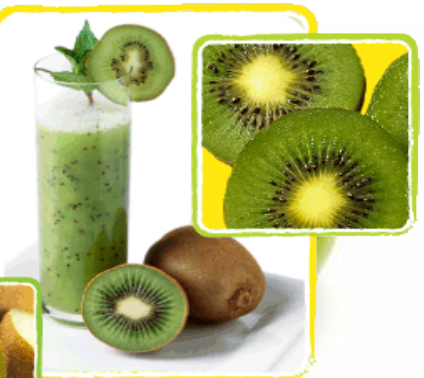
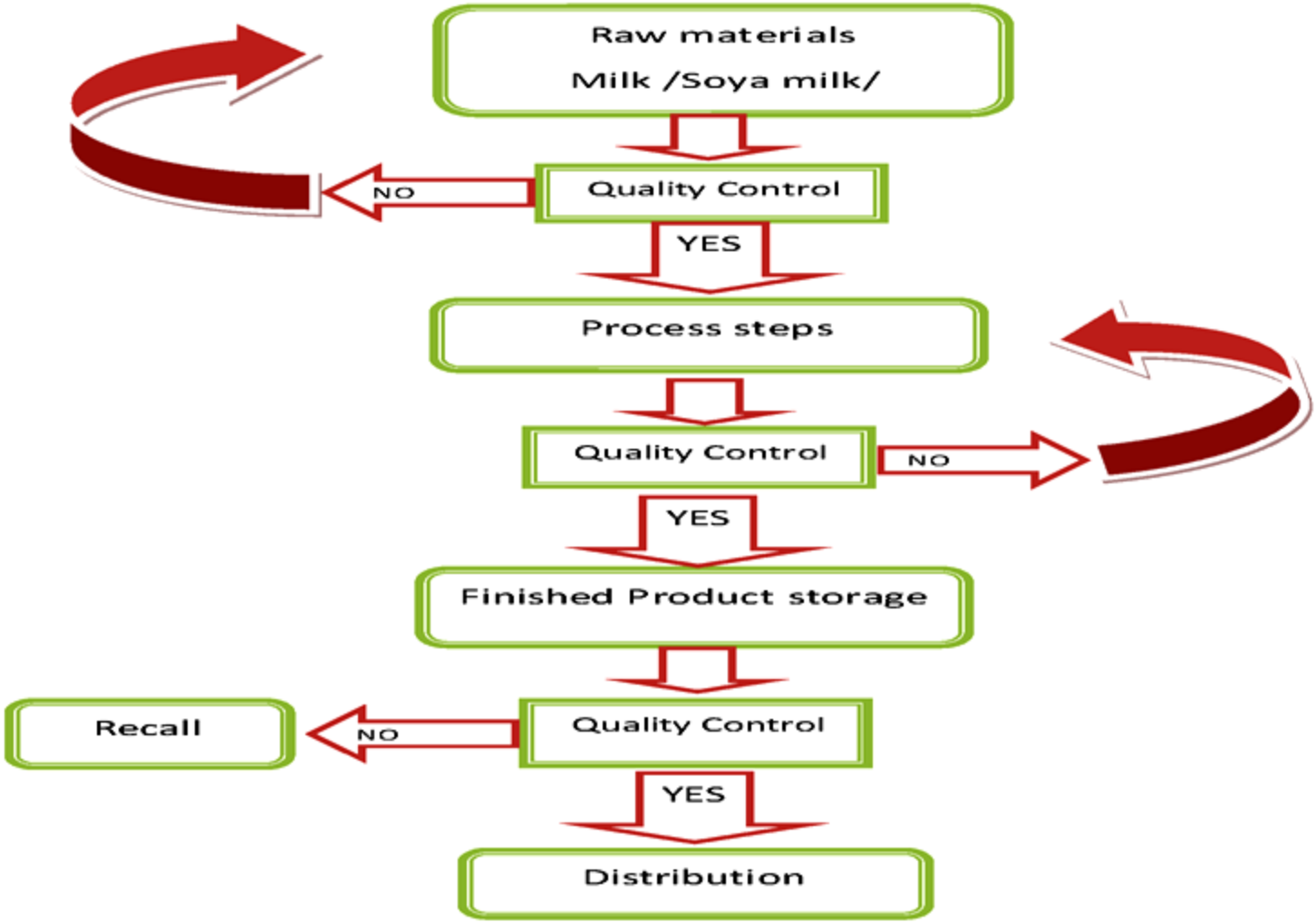


Chart for quality control



Raw materials

Milk, Soya Milk, Kiwi, Water, Sugar, Starter cultures

Standard plate count, coliform bacteria count, laboratory pasteurized count, preliminary incubation count, somatic cell count, titratable acidity, temperature, appearance, antibiotics and other drugs, etc.

Table 4. Basic requirements for soya milk and milk

Attribute	Requirement
Temperature on arrival	$<10°C$
Total colony count	$\leq 100\,000$ cfuml^{-1} (target) (<250 000 cfuml^{-1} may well be acceptable in practice)
Inhibitory substances	≤ 0.007IUml^{-1} (0.004mgml^{-1})
Chemical composition	≥ 3.0 g fat 100 g^{-1} ≥ 3.0 g protein 100 g^{-1}
Somatic cell count	$\leq 4.0\times10^{5}$ ml^{-1}
Freezing point depression	$\leq 0.520°C$
Titratable acidity	$\leq 0.2\%$ lactic acid

QC for Processing

- Chemical compositions

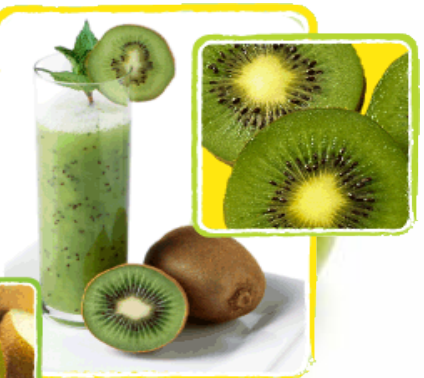
  Fat and Total Solids

- Physical characteristics

  Viscosity by Rotational Viscometers

- Microbiological factors

  Coliform Bacteria Count

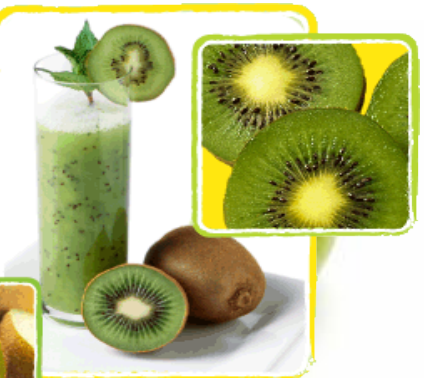


QC for Finished Products

- Sampling
- Weight Specification
- Equipments Check
- Packaging Materials

  Sterility Testing

  Check Print Quality
- Sensory Test



Plan of action

- Finish shelf life experiment
- Propose marketing plan with marketing strategy
- Propose a product launch strategy
- Product test launch with presentation of final

Conclusion

- Optimised the product by performing unfinished task of unit III.
- Determined intrinsic and extrinsic factors affecting shelf life
- Proposed packaging material
- Demonstrated that product and production process is in compliance with legislation
- Proposed a prerequisite programme for GMP and GHP
- Conducted a HACCP analysis of production process
- Proposed plan for quality control of raw material and finished product.


Thank You!